

REMARKS

Entry of the amendments is respectfully requested. Claims 1, 3, 9, 22 and 25 have been amended. Claims 2 and 26 have been canceled. Claims 34-35 have been added. Claims 1, 3-9, 22-25, and 27-35 are pending in the application. Favorable reconsideration and allowance of this application is respectfully requested in light of the foregoing amendments and the remarks that follow.

1. Claim Objections

The Examiner has indicated that if either claims 9 or 24 be found allowable, claim 25 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. Applicants note that claim 9, which depends from claim 1, further requires “at least one of the surfaces defining the sealed cavity is formed of titanium.” Claim 24, which depends from claim 1, further requires “wherein a sealed cavity is located in the device.” Claim 25 is an independent claim that recites a device having electrical and mechanical components. Claim 25 requires a sealed cavity to be located in the device. However, there is no requirement, as in claim 9, of “at least one of the surfaces defining the sealed cavity is formed of titanium.” Rather, claim 25 is worded differently in stating that the first layer or set of layers is exposed to the sealed cavity. Therefore, claim 25 is not duplicative of claim 9. Furthermore, claim 25 differs from claim 24, which depends from claim 1, in that claim 24 requires a second layer overlying the first layer. In contrast, claim 25 does not require this. Thus, claim 24 is not duplicative of claim 25.

Accordingly, withdrawal of the potential objection to claim 25 is respectfully requested.

2. Rejection Under § 102(e)

Claims 1-2, 4, 7-9, 22-26, and 31-33 stand rejected under § 102(e) as being anticipated by U.S. Patent No. 6,078,103 to Turner. Claims 1 and 25 have been amended in

a manner believed to patently define over the Turner patent. Favorable reconsideration and allowance of this application are respectfully requested in light of the foregoing amendments and the remarks that follow.

Claim 1 recites a device having electrical and mechanical components. The device has multiple layers. Claim 1 has been amended as follows:

a first layer or set of layers arranged to function as one or more electrodes or conductors; and

a second layer overlying the first layer and arranged to function as one or more press contacts or wire bond pads, wherein the second layer has different physical properties than the first layer, wherein the first layer or set of layers is relatively hard or tough **and is formed from titanium**, and **wherein** the second layer is relatively soft or malleable.

Thus, claim 1 requires that the first layer or set of layers be formed from titanium and the second layer to overlie the first layer. Forming the first layer or set of layers from titanium provides the benefit of a particularly hard layer. This ensures good contact with the bonding pad.

The Examiner alleges that the Turner patent, at column 3, lines 1-32, discloses that the trace can be formed from titanium by anodic bonding and that the dimpled contact, attached to the trace, for the attachment of the semiconductor device, can be made of gold. However, the Turner patent merely discloses that the conductive trace may comprise a layer of almost any conductor, such as gold. (col. 3, lines 1-2). Thus, the genus “almost any conductor” and the species “gold” are disclosed, not the claimed species *titanium*. Therefore, amended claim 1, which requires the first layer or set of layers to be formed from titanium is not anticipated by the disclosure of the genus “almost any conductor” and the species “gold” by the Turner patent.

Furthermore, when Turner discusses using titanium in its metallic layer 54, it is as an adhesive layer of titanium, followed by an intermediate layer of platinum and a conductor layer of gold sequentially formed. (col. 6, lines 14-17). Thus, the titanium layer

of Turner does not function as one or more electrodes or conductors, as amended claim 1 requires. And, the metallic layer 54 of Turner is configured to be disposed in a recess in substrate 14. The thickness of the metallic layer 54 of Turner is such that the adhesive layer of titanium is contained within the recess in substrate 14, and the adhesive layer of titanium is not exposed outwardly of the substrate. Moreover, the outer layer of gold in the metallic layer 54 would make the metallic layer 54 relatively soft. In contrast, claim 1 requires the first layer or set of layers to be relatively hard or tough.

For the above reasons, claim 1 is believed to patentably define over the Turner reference. A review of the remaining references of record similarly fails to show or suggest the claimed subject matter, and claim 1 is thus believed to be allowable.

Dependent claim 2 has been canceled herein, obviating the rejection of this claim. Dependent claims 4, 7-9 and 22-24 are believed to be in condition for allowance for incorporating by reference the limitations of claim 1 and for defining additional features of the invention, which, when considered in combination with those of claim 1, are not disclosed by Turner. For instance, claim 4 further requires the second layer to function as one or more press contacts or wire bond pads and to be formed from one of aluminum or gold. In the Turner patent, a second metallic layer 60 comprises an adhesive layer of platinum and a conductive layer of gold sequentially formed. (col. 6, lines 39-40). Although second metallic layer 60 includes a gold layer, it functions as a conductor, not as one or more press contacts or wire bond pads, as claim 4 requires.

Claim 9 requires that "the device includes a sealed cavity defined by one or more surfaces, and wherein at least one of the surfaces defining the sealed cavity is formed of titanium." The Examiner alleged that a mesa 32 is bonded to the insulating substrate by anodic bonding, which allegedly creates a sealed cavity, and that the mesa 32 encloses a portion of the conductive trace as well as the dimpled contact. However, the Turner patent actually lacks a cavity because "the pressure created by the mesa 32 being attracted to the insulating substrate 14 essentially crushes the dimple 20 underneath the mesa 32, forming

intimate contact between the silicon mesa 32 and the tongue 16.” (col. 5, lines 32-35). This disclosure of Turner cannot reasonably be interpreted as a sealed cavity, as claimed. Furthermore, there is no disclosure of any of the surfaces that form the sealed cavity are formed of titanium, as claimed. Hence, claim 9 defines over the Turner patent.

Independent claim 25 recites a device having electrical and mechanical components. The device has multiple layers. Claim 25 has been amended to require

a first layer or set of layers arranged to function as one or more electrodes or conductors; and
a second layer arranged to function as one or more press contacts or wire bond pads, wherein the second layer has different physical properties than the first layer, wherein the first layer or set of layers is relatively hard or tough and **is formed from titanium, and** the second layer is relatively soft or malleable,

Claim 25 further requires “wherein a sealed cavity is located in the device, **and wherein the first layer or set of layers is exposed to the sealed cavity..**”

As is discussed above, the titanium layer of Turner does not function as one or more electrodes or conductors, as amended claim 25 requires. As is also discussed above, the Turner patent lacks a sealed cavity, and therefore by definition lacks a sealed cavity formed of a titanium surface. For at least these reasons, claim 25 and claims 31-33, which depend therefrom, define over the Turner patent. Claim 26 has been canceled, obviating the rejection of this claim.

In light of the foregoing, withdrawal of the rejection of claims 1-2, 4, 7-9, 22-26, and 31-33 based on Turner is respectfully requested.

3. Rejection Under § 103

The rejection of claims 3, 5-6, 27, and 29-30 as unpatentable over the Turner patent in view of U.S. Patent No. 5,592,736 to Akram is respectfully traversed, because, *inter alia*, there is no teaching or suggestion to modify the reference to produce the claimed

invention. MPEP §2143.01. The Examiner correctly recognizes that Turner fails to disclose a Ti/TiN layer structure as the first layer combination. The Examiner attempts to cure this deficiency by citing Akram et al. for its alleged teaching of a TiN/Ti conductive layer. Akram et al. discloses an interconnect 10 for testing an unpackaged semiconductor device having raised contact locations, e.g., bumped bond pads. The interconnect 10 includes a substrate 12. (col. 5, lines 3-7).

Dependent claims 3 and 27 are believed to patentably define over the disclosure of Turner alone or in combination with Akram et al. Claims 3 and 27 both require that “the first layer of set of layers is formed from titanium and titanium nitride.” There is no teaching or suggestion in Akram et al. of such a layer or set of layers being formed from titanium and titanium nitride. Instead, the only disclosure in Akram et al. regarding titanium nitride is that the barrier layer 68, which overlies a bonding layer 70, may be formed of platinum, titanium or a titanium alloy, e.g., TiN. (col. 7, lines 48-50). In Akram, a conductive layer 66A may include a barrier layer 68 and a bonding layer 70. (col. 7, lines 32-34). The bonding layer 70 may be formed of aluminum, tungsten or titanium. The barrier layer 68, which overlies the bonding layer 70, may be formed of platinum, titanium or a titanium alloy, e.g., TiN. (col. 7, lines 48-56). This is the reverse of the arrangement of the present invention as defined in claim 1, which specifies that the first layer, which functions as electrodes or conductors, is a relatively hard or tough material and is formed from titanium and the second layer, which functions as press contacts or wire bond pads, is formed of a relatively soft or malleable material such as aluminum.

Dependent claims 5-6 and 29-30 are believed to be in condition for allowance for incorporating by reference the limitations of claim 1 and claim 25, respectively, and for defining additional features of the invention which, when considered in combination with those of their respective base claim, are neither disclosed, taught, or suggested by the prior art relied upon in the rejection.

For example, claims 5-6 require specific thickness for the first layer or set of layers. The claimed thickness of the first layer provides the layer the ability to be etched without affecting the other layer or layers. Furthermore, the claimed thickness of the first layer limits or prevents plastic deformation and permanent shape change under the extreme conditions that are used during anodic bonding, which can be used to assemble the devices. The claimed thicknesses permit etching of the second layer without affecting the other layer or layers. Additionally, the claimed thicknesses allow the second layer to deform during anodic bonding, which can be used to assemble the devices.

Thus, the references alone or in combination fail to teach or suggest the device of claims 3, 5-6, 27, and 29-30. In light of the foregoing, withdrawal of the rejection of these claims is respectfully requested.

4. New Claims

New claims 34 and 35 have been added. New claims 34 and 35 are dependent claims that further require “wherein the additional titanium in the sealed cavity acts as a getter in the sealed cavity.” These additional claims are believed to patentably define over the patents of record, as neither the Turner patent nor the Akram et al. patent discloses, teaches, or suggests a device having a sealed cavity. Furthermore, in the invention of claims 36 and 37, having the titanium act as a getter, i.e., a material that absorbs impurities, provides the unexpected advantage of reducing the gas pressure in the sealed cavity after anodic bonding and acts as such even at room temperature. This improves the control of the gas pressure in the sealed cavity. This is not possible with the arrangements of the prior art. For example, in Turner, the titanium is covered, thus, it cannot act as a getter.

Serial No. 09/711,834 to HENRIK JAKOBSEN ET AL.
Art Unit: 1775 – Attorney Docket 352.007
Page 12

CONCLUSION

It is submitted that claims 1, 3-9, 22-25, and 27-35 are in compliance with 35 U.S.C. §§ 102 and 103 and each defines patentable subject matter. A Notice of Allowance is therefore respectfully requested.

The Examiner is invited to contact the undersigned by telephone if any questions remain after consideration of this response, or if such would otherwise facilitate prosecution.

Respectfully submitted,

Date: 6/19/03

By Andrew S. McConnell
Andrew S. McConnell (Reg. No. 32,272)

Boyle, Fredrickson, Newholm,
Stein & Gratz, S.C.
250 East Wisconsin Avenue, Suite 1030
Milwaukee, WI 53202
Telephone: (414) 225-9755
Facsimile: (414) 225-9753

Attorney Docket No.: 352.007